Title: *Model Predicts New Magnetospheric Phenomenon* February 2002
Cluster: *Cross-Theme Theory and Data Analysis*
Contributor: *R. Wolf/Rice Univ.*

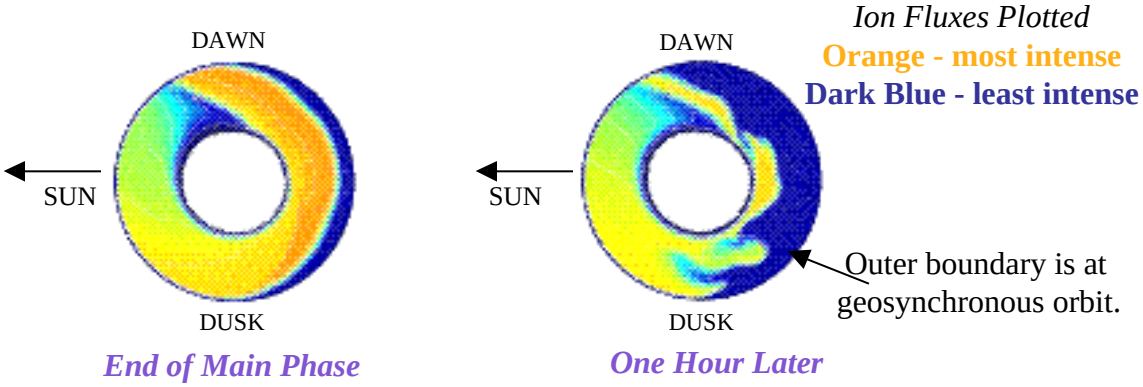
- **Can Interchange Instability Break Up Storm-Time Ring Current?**

Simulations carried out recently with the Rice Convection Model (RCM) predict that the magnetic storm-time ring current surrounding the Earth can sometimes be rapidly destroyed by the plasma interchange instability mechanism. In this process, ring-current particles in the inner magnetosphere rapidly exchange positions with outer, less densely populated magnetic flux tubes, when the magnetic storm main phase ends with a reduction in the solar wind and plasma sheet densities. After the interchange, the ring current plasma gets caught up in the general sunward drift of the plasma sheet, and is subsequently rapidly lost to the solar wind.

An observable and confirming sign of this breakup would be swirling plasma flow patterns in the evening ionosphere, equatorward of the auroral zone. Observers are encouraged to look for this phenomenon. The swirls could be detected by a mid-latitude incoherent-backscatter radar, taking measurements at the right place at the right time. Also, Energetic Neutral Atom imagers, such as those carried by the IMAGE spacecraft, should provide a vivid picture of the phenomena if snapshots are taken when Nature is in the act of ejecting the ring current.

This is an example of how research partially supported by the SEC Theory program is synergistic with current NASA missions and provides direction for future planning of experiments to unravel key processes in the Sun-to-Earth connection and Space Weather.

Rapid Loss of Ring Current Ions
(Equatorial plane simulation of September 24-25, 1998 magnetic storm)



Reference: Sazykin, S., R.A. Wolf, R.W. Spiro, T.I. Gombosi, D.L. De Zeeuw, and M.F. Thomsen, Interchange instability in the inner magnetosphere associated with geosynchronous flux decreases, *Geophys. Res. Lett. (In Press)*, 2002.